

Post-doctoral position in “Hybrid strategies for vision restoration”

Commitment & contract: two-year postdoc contract

Location: Center for Synaptic Neuroscience and Technology, The Italian Institute of Technology, Genova, Italy

At IIT, we are committed to advancing human-centered Science and Technology to address the most urgent societal challenges of our era. We foster excellence in both fundamental and applied research, spanning fields such as neuroscience and cognition, humanoid technologies and robotics, artificial intelligence, nanotechnology, and material sciences, offering a truly interdisciplinary scientific experience. Our approach integrates cutting-edge tools and technology, empowering researchers to push the limits of knowledge and innovation. With us, your curiosity will know no bounds.

We are dedicated to providing equal employment opportunities and fostering diversity in all its forms, creating an inclusive environment. We value the unique experiences, knowledge, backgrounds, cultures, and perspectives of our people. By embracing diversity, we believe science can achieve its fullest potential.

THE ROLE

You will work in a multicultural and multi-disciplinary group, where junior and senior scientists collaborate, each with their expertise, to carry out a scientific activity with a shared research goal.

The *Neuroscience and Smart Materials* Research line is coordinated by Prof. FABIO BENFENATI. The research focuses on:

- 1. Hybrid electrical synapses for wireless photostimulation.** We demonstrated that polymeric NPs form “electrical synapses” with target neurons that are capacitively depolarized to rescue vision in animal models of Retinitis pigmentosa (RP). To make photostimulation cell-specific, we plan to functionalize NPs with recombinant antibodies targeting mGluR6, a unique marker of ON-bipolar cells. This would allow targeting the ON pathway in a gene-free fashion and restoring the ON/OFF signature of retinal processing responsible for spatial resolution and contrast sensitivity. We will also exploit the effects of polymeric NIR-sensitive NPs in the brain to stimulate denervated neurons on demand.
- 2. Membrane-targeted photochromic compounds for neuronal photostimulation.** The project aims to investigate novel intramembrane, azobenzene-based actuators that elicit light-triggered neuronal stimulation. The actuators dwell in the membrane and behave as light-driven molecular machines that bidirectionally perturb the membrane, impacting its passive and active properties and, eventually, neuronal excitability. We will exploit these compounds for the brain and retina with nanostructures capable of slow and prolonged release in the nervous tissue. In the retina, preliminary ex-vivo evidence shows that these bifunctional compounds successfully recreate the mosaic of ON and OFF cells that generate visual acuity and contrast sensitivity, representing a very interesting solution for transferring this strategy to RP patients.
- 3. Boost plasticity of the retina and the visual cortex to improve the processing and perception of bionic inputs.** We plan to enhance the plasticity of the retina by either downregulating

the transcription factor REST, a physiological repressor of neuronal genes, or by environmental enrichment (EE) characterized by high-level multisensory stimulation, physical activity, and social interaction. The same strategies will be employed at the level of the primary visual cortex.

Within the research team, your main responsibilities will be:

- *in vivo* studies in experimental models of retinal degeneration, including *in vivo* transduction with viral vectors
- study of the role of cross-modal plasticity in the visual restoration process

ESSENTIAL REQUIREMENTS

- A PhD in Neuroscience, Biotechnology, Molecular Biology, or similar disciplines
- Documented experience in life science research and preclinical models
- Good publication record
- Good command of spoken and written English

ADDITIONAL SKILLS

- Experience in molecular and cellular biology, *ex vivo* electrophysiology, and *in vivo* functional and behavioral studies will be greatly appreciated, along with certification for animal experimentation
- Ability to work in a challenging and international environment
- Capacity to work autonomously and collaboratively in a highly interdisciplinary environment
- Possess analytical reasoning skills and a growth mindset

COMPENSATION PACKAGE

- A yearly gross salary of 34,000 €
- Candidates from abroad or Italian citizens who have carried out scientific research activity permanently abroad and meet specific requirements may be entitled to a deduction from taxable income of up to 90% from 6 to 13 years.

This open position is financed by *the Italian Institute of Technology* within the Flagship Technologies for Healthy Living.

Please submit your application using the online form, including a detailed CV, university transcripts, cover letter, and contact details of 2 references.

Application's deadline: June 25, 2025

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